Amendment to the Claims

Please cancel claims 87-90 without prejudice.

1. (Original) An apparatus for electrochemical processing of microelectronic workpieces, comprising:

a reaction vessel comprising -

an outer container having an outer wall;

a first outlet configured to introduce a primary flow into the outer container;

at least one second outlet configured to introduce a secondary flow into the outer container separate from the primary flow;

a dielectric field shaping unit in the outer container coupled to the second outlet to receive the secondary flow, the field shaping unit being configured to contain the secondary flow separate from the primary flow through at least a portion of the outer container, and the field shaping unit having at least one electrode compartment through which the secondary flow can pass while the secondary flow is separate from the primary flow; and

an electrode in the electrode compartment.

2. (Original) The apparatus of claim 1, further comprising a primary flow guide including:

a first baffle having a plurality of first apertures through which at least the primary flow can pass; and

a second baffle downstream from the first baffle, the second baffle having a plurality of second apertures through which the primary flow can pass after passing through the first apertures.

3. (Original) The apparatus of claim 1, further comprising a primary flow guide including:

an annular outer baffle centered on a common axis, the outer baffle having a plurality of first apertures; and

an annular inner baffle positioned concentrically inside the outer baffle, the inner baffle having a plurality of second apertures, wherein the primary flow passes through the first apertures of the outer baffle and then through the second apertures of the inner baffle.

4. (Original) The apparatus of claim 1, further comprising a primary flow guide including:

an annular outer baffle centered on a common axis, the outer baffle having a plurality of generally vertical slots; and

an annular inner baffle positioned concentrically inside the outer baffle, the inner baffle having an inverted frusto-conical shaped wall with a plurality of annularly extending radial slots that slant upward relative to the common axis, wherein the primary flow passes through the vertical slots of the outer baffle and then through the annular slots of the inner baffle to project radially inward and upward relative to the common axis along a plurality of diametrically opposed vectors.

5. (Original) The apparatus of claim 1 wherein the field shaping unit comprises a dielectric wall disposed within the outer wall of the outer container and the electrode compartment is between the dielectric wall and the outer wall, wherein the secondary flow passes through the electrode compartment on one side of the dielectric wall and the primary flow passes on another side of the dielectric wall.

6. (Original) The apparatus of claim 1 wherein the field shaping unit comprises an annular wall in the outer container, the annular wall being spaced radially inward of the outer wall to define a center opening centered on a common axis and the electrode compartment being between the annular wall and the outer wall such that the

primary flow passes through the center opening and the secondary flow passes through the electrode compartment.

7. (Original) The apparatus of claim 1 wherein:

the field shaping unit comprises a first annular wall centered on a common axis in the outer container, the first annular wall being spaced radially inward of the outer wall, and a second annular wall in the outer container concentric with first annular wall and between the first annular wall and the outer wall, wherein an inner surface of the second annular wall defines an outer side of a first electrode compartment and an outer surface of the second annular wall defines an inner side of a second electrode compartment; and

the apparatus further comprises a first annular electrode in the first electrode compartment and a second annular electrode in the second electrode compartment.

8. (Original) The apparatus of claim 1 wherein:

the field shaping unit comprises -

a first annular wall in the outer container centered on a common axis, the first annular wall being spaced radially inward of the outer wall,

a second annular wall in the outer container concentric with first annular wall and between the first annular wall and the outer wall, wherein an inner surface of the second annular wall defines an outer side of a first electrode compartment and an outer surface of the second annular wall defines an inner side of a second electrode compartment, and

a virtual electrode unit having a first partition and a second partition, the first partition having a first lateral section coupled to the first and second annular walls and a first annular lip projecting from the first lateral section to define an interior flow path for the primary flow, and a second partition having a second lateral section above the first lateral section and a second annular lip projecting from the second lateral section, the

second annular lip surrounding the first annular lip to define an annular opening therebetween; and

the apparatus further comprises a first annular electrode in the first electrode compartment and a second annular electrode in the second electrode compartment.

9. (Original) The apparatus of claim 1, further comprising a distributor coupled to the outer container, the distributor having a central outlet defining the first outlet and a plurality of outer outlets defining second outlets.

10. (Original) The apparatus of claim 9 wherein the distributor comprises:

an inlet for receiving the primary flow and an annular cavity coupled to the inlet, the annular cavity defining the central outlet;

a plenum separate from the inlet for receiving the secondary flow, a plurality of upper orifices in an upper part of the plenum, a plurality of lower orifices in a lower part of the plenum, and a plurality of channels extending from the orifices to corresponding outer outlets.

11. (Original) The apparatus of claim 9 wherein the distributor comprises:

an annular body having a plurality of annular steps;

an inlet extending through the body for receiving the primary flow;

a plenum separate from the inlet for receiving the secondary flow, a plurality of upper orifices in an upper part of the plenum, and a plurality of lower orifices in a lower part of the plenum; and

a plurality of channels extending from the orifices to corresponding outer outlets at the steps of the annular body.

12. (Original) The apparatus of claim 1, further comprising an interface member carried by the field shaping unit downstream from the electrode, the interface member being in fluid communication with the second flow in the electrode

compartment, and the interface member being configured to prevent selected matter of the secondary flow from passing to the primary flow and/or to prevent selected matter of the primary flow from passing to the secondary flow.

13. (Original) The apparatus of claim 12 wherein the interface member comprises a filter capable of removing particles from the secondary flow and/or the primary flow.

14. (Original) The apparatus of claim 12 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass between the secondary flow and the primary flow.

15. (Original) The apparatus of claim 12 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass between the secondary flow and the primary flow, and wherein the ion-membrane is at least substantially impermeable to fluids of the second flow and the primary flow.

16. (Original) The apparatus of claim 12 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass between the secondary flow and the primary flow, and wherein the ion-membrane is at least substantially permeable to fluids of the second flow and/or the primary flow.

17. (Original) The apparatus of claim 1 further defining a processing tool including the reaction vessel, the apparatus further comprising:

a cabinet having an interior enclosure;

an electrochemical processing station in the enclosure, the processing station having -

a head assembly including a workpiece support for holding a workpiece, and

a processing chamber having a housing, wherein the reaction vessel is in the housing; and

a transfer device in the enclosure, the transfer device having an end-effector for handling microelectronic workpieces in the cabinet.

18. (Original) The apparatus of claim 17 wherein the reaction vessel further comprises a primary flow guide including:

a first baffle having a plurality of first apertures through which at least the primary flow can pass; and

a second baffle downstream from the baffle, the second baffle having a plurality of second apertures through which the primary flow can pass after passing through the first apertures.

19. (Original) The apparatus of claim 17 wherein the field shaping unit of the reaction vessel comprises a dielectric wall disposed within the outer wall of the container and the electrode compartment is between the dielectric wall and the outer wall, wherein the secondary flow passes through the electrode compartment on one side of the dielectric wall and the primary flow passes on another side of the dielectric wall.

20. (Original) The apparatus of claim 17 wherein the reaction vessel further comprises a distributor coupled to the outer container, the distributor having a central outlet defining the first outlet and a plurality of outer outlets defining second outlets.

21. (Original) The apparatus of claim 17 wherein the reaction vessel further comprises an interface member carried by the field shaping unit downstream from the electrode, the interface member being configured to prevent selected matter of the secondary flow from passing to the primary flow and/or to prevent selected matter of the primary flow from passing to the secondary flow.

22. (Original) A reaction vessel for an electrochemical processing chamber used to process microelectronic workpieces, comprising:

an outer container having an outer wall;

a distributor coupled to the outer container, the distributor having a first outlet configured to introduce a primary flow into the outer container and at least one second outlet configured to introduce a secondary flow into the outer container separate from the primary flow;

a dielectric field shaping unit in the outer container coupled to the distributor to receive the secondary flow, the field shaping unit being configured to contain the secondary flow separate from the primary flow through at least a portion of the outer container, and the field shaping unit having at least one electrode compartment through which the secondary flow can pass while the secondary flow is separate from the primary flow;

an electrode in the electrode compartment; and

an interface member carried by the field shaping unit downstream from the electrode, the interface member being in fluid communication with the secondary flow in the electrode compartment, and the interface member being configured to prevent selected matter of the secondary flow from passing to the primary flow and/or to prevent selected matter of the primary flow from passing to the secondary flow.

23. (Original) The apparatus of claim 22, further comprising a primary flow guide including:

a first baffle having a plurality of first apertures through which at least the primary flow can pass; and

a second baffle downstream from the first baffle, the second baffle having a plurality of second apertures through which the primary flow can pass after passing through the first apertures.

24. (Original) The apparatus of claim 22, further comprising a primary flow guide including:

an annular outer baffle centered on a common axis, the outer baffle having a plurality of first apertures; and

an annular inner baffle positioned concentrically inside the outer baffle, the inner baffle having a plurality of second apertures, wherein the primary flow passes through the first apertures of the outer baffle and then through the second apertures of the inner baffle.

25. (Original) The apparatus of claim 22 wherein the field shaping unit comprises a dielectric wall disposed within the outer wall of the outer container and the electrode compartment is between the dielectric wall and the outer wall, wherein the secondary flow passes through the electrode compartment on one side of the dielectric wall and the primary flow passes on another side of the dielectric wall.

26. (Original) The apparatus of claim 22 wherein:

the field shaping unit comprises a first annular wall centered on a common axis in the outer container, the first annular wall being spaced radially inward of the outer wall, and a second annular wall in the outer container concentric with first annular wall and between the first annular wall and the outer wall, wherein an inner surface of the second annular wall defines an outer side of a first electrode compartment and an outer surface of the second annular wall defines an inner side of a second electrode compartment; and

the apparatus further comprises a first annular electrode in the first electrode compartment and a second annular electrode in the second electrode compartment.

27. (Original) The apparatus of claim 22 wherein:

the field shaping unit comprises -

a first annular wall in the outer container centered on a common axis, the first annular wall being spaced radially inward of the outer wall,

a second annular wall in the outer container concentric with first annular wall and between the first annular wall and the outer wall, wherein an inner surface of the second annular wall defines an outer side of a first electrode compartment and an outer

surface of the second annular wall defines an inner side of a second electrode compartment, and

a virtual electrode unit having a first partition and a second partition, the first partition having a first lateral section coupled to the first and second annular walls and a first annular lip projecting from the first lateral section to define an interior flow path for the primary flow, and a second partition having a second lateral section above the first lateral section and a second annular lip projecting from the second lateral section, the second annular lip surrounding the first annular lip to define an annular opening therebetween; and

the apparatus further comprises a first annular electrode in the first electrode compartment and a second annular electrode in the second electrode compartment.

28. (Original) The apparatus of claim 22 wherein the distributor comprises:

an inlet for receiving the primary flow, the first outlet being in fluid communication with the inlet; and

a plenum separate from the inlet for receiving the secondary flow, a plurality of upper orifices in an upper part of the plenum, a plurality of lower orifices in a lower part of the plenum, and a plurality of channels extending from the orifices to a plurality of outer outlets, wherein the outer outlets define second outlets.

29. (Original) The apparatus of claim 22 wherein the distributor comprises:

an annular body having a plurality of annular steps;

an inlet extending through the body for receiving the primary flow, the first outlet being in fluid communication with the inlet;

a plenum separate from the inlet for receiving the secondary flow, a plurality of upper orifices in an upper part of the plenum, and a plurality of lower orifices in a lower part of the plenum; and

a plurality of channels extending from the orifices to a plurality of outer outlets at the steps of the annular body, the outer outlet defining second outlets.

30. (Original) The apparatus of claim 22 wherein the interface member comprises a filter capable of removing particles from the secondary flow before the secondary flow joins the primary flow.

31. (Original) The apparatus of claim 22 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass from the secondary flow to the primary flow.

32. (Original) The apparatus of claim 22 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass from the secondary flow to the primary flow, and wherein the ion-membrane is at least substantially impermeable to fluid of the second flow.

33. (Original) The apparatus of claim 22 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass from the secondary flow to the primary flow, and wherein the ion-membrane is at least substantially permeable to fluid of the second flow.

34. (Original) A reaction vessel for an electrochemical processing chamber used to process microelectronic workpieces, comprising:

an outer container having an outer wall;

a distributor coupled to the outer container, the distributor having a first outlet configured to introduce a primary flow into the outer container and at least one second outlet configured to introduce a secondary flow into the outer container separate from the primary flow;

a primary flow guide in the outer container coupled to the distributor to receive the primary flow from the first outlet and direct it to a workpiece processing site;

a dielectric field shaping unit in the outer container coupled to the distributor to receive the secondary flow from the second outlet, the field shaping unit being

configured to contain the secondary flow separate from the primary flow through at least a portion of the outer container, and the field shaping unit having at least one electrode compartment through which the secondary flow can pass while the secondary flow is separate from the primary flow;

an electrode in the electrode compartment; and

an interface member carried by the field shaping unit downstream from the electrode, the interface member being in fluid communication with the secondary flow in the electrode compartment, and the interface member being configured to prevent selected matter of the secondary flow from passing to the primary flow.

35. (Original) The apparatus of claim 34 wherein the primary flow guide comprises:

a first baffle having a plurality of first apertures through which at least the primary flow can pass; and

a second baffle downstream from the first baffle, the second baffle having a plurality of second apertures through which the primary flow can pass after passing through the first apertures.

36. (Original) The apparatus of claim 34 wherein the primary flow guide comprises:

an annular outer baffle centered on a common axis, the outer baffle having a plurality of first apertures; and

an annular inner baffle positioned concentrically inside the outer baffle, the inner baffle having a plurality of second apertures, wherein the primary flow passes through the first apertures of the outer baffle and then through the second apertures of the inner baffle.

37. (Original) The apparatus of claim 34 wherein the primary flow guide comprises:

an annular outer baffle centered on a common axis, the outer baffle having a plurality of generally vertical slots; and

an annular inner baffle positioned concentrically inside the outer baffle, the inner baffle having an inverted frusto-conical shaped wall with a plurality of annularly extending radial slots that slant upward relative to the common axis, wherein the primary flow passes through the vertical slots of the outer baffle and then through the annular slots of the inner baffle to project radially inward and upward relative to the common axis along a plurality of diametrically opposed vectors.

38. (Original) The apparatus of claim 34 wherein the field shaping unit comprises a dielectric wall disposed within the outer wall of the outer container and the electrode compartment is between the dielectric wall and the outer wall, wherein the secondary flow passes through the electrode compartment on one side of the dielectric wall and the primary flow passes on another side of the dielectric wall.

39. (Original) The apparatus of claim 34 wherein:

the field shaping unit comprises a first annular wall centered on a common axis in the outer container, the first annular wall being spaced radially inward of the outer wall, and a second annular wall in the outer container concentric with first annular wall and between the first annular wall and the outer wall, wherein an inner surface of the second annular wall defines an outer side of a first electrode compartment and an outer surface of the second annular wall defines an inner side of a second electrode compartment; and

the apparatus further comprises a first annular electrode in the first electrode compartment and a second annular electrode in the second electrode compartment.

40. (Original) The apparatus of claim 34 wherein:

the field shaping unit comprises -

a first annular wall in the outer container centered on a common axis, the first annular wall being spaced radially inward of the outer wall,

a second annular wall in the outer container concentric with first annular wall and between the first annular wall and the outer wall, wherein an inner surface of the second annular wall defines an outer side of a first electrode compartment and an outer surface of the second annular wall defines an inner side of a second electrode compartment, and

a virtual electrode unit having a first partition and a second partition, the first partition having a first lateral section coupled to the first and second annular walls and a first annular lip projecting from the first lateral section to define an interior flow path for the primary flow, and a second partition having a second lateral section above the first lateral section and a second annular lip projecting from the second lateral section, the second annular lip surrounding the first annular lip to define an annular opening therebetween; and

the apparatus further comprises a first annular electrode in the first electrode compartment and a second annular electrode in the second electrode compartment.

41. (Original) The apparatus of claim 34 wherein the distributor comprises:

an inlet for receiving the primary flow and an annular cavity coupled to the inlet, the annular cavity defining the first outlet;

a plenum separate from the inlet for receiving the secondary flow, a plurality of upper orifices in an upper part of the plenum, a plurality of lower orifices in a lower part of the plenum, and a plurality of channels extending from the orifices to a plurality of outer outlets, wherein the outer outlets define second outlets.

42. (Original) The apparatus of claim 34 wherein the distributor comprises:

an annular body having a plurality of annular steps;

an inlet extending through the body for receiving the primary flow;

a plenum separate from the inlet for receiving the secondary flow, a plurality of upper orifices in an upper part of the plenum, and a plurality of lower orifices in a lower part of the plenum; and

a plurality of channels extending from the orifices to a plurality of outer outlets at the steps of the annular body.

43. (Original) The apparatus of claim 34 wherein the interface member comprises a filter capable of removing particles from the secondary flow before the secondary flow joins the primary flow.

44. (Original) The apparatus of claim 34 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass from the secondary flow to the primary flow.

45. (Original) The apparatus of claim 34 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass from the secondary flow to the primary flow, and wherein the ion-membrane is at least substantially impermeable to fluid of the second flow.

46. (Original) The apparatus of claim 34 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass from the secondary flow to the primary flow, and wherein the ion-membrane is at least substantially permeable to fluid of the second flow.

47. (Original) A reaction vessel for an electrochemical processing chamber used to process microelectronic workpieces, comprising:

an outer container having an outer wall;

a first fluid conduit carried by the outer container, the first fluid conduit having a first inlet and a primary flow channel coupled to the first inlet, the primary flow channel being in the outer container and configured to direct a primary fluid flow toward a workpiece processing site;

a second fluid conduit carried by the outer container, the second fluid conduit having a dielectric field shaping unit including at least one electrode compartment, the second fluid conduit containing a secondary fluid flow separate from the primary fluid flow through at least a portion of the outer container;

at least one interface member carried by the field shaping unit configured to prevent selected matter of the secondary fluid flow from passing to the primary fluid flow; and

at least one electrode in the at least one electrode compartment upstream from the interface member.

48. (Original) A reaction vessel for an electrochemical processing chamber used to process microelectronic workpieces, comprising:

a container having an outer wall;

a plurality of compartments in the container including at least a first electrode compartment and a second electrode compartment separate from the first electrode compartment through at least a portion of the container, the electrode compartments being configured to contain an electrochemical processing solution;

a plurality of separate electrodes including at least a first electrode in the first electrode compartment and a second electrode in the second electrode compartment; and

at least a first interface member at the first electrode compartment between the first electrode and a workpiece site at which a workpiece can be processed, the first interface member being configured to prevent selected matter to pass across the first interface member.

49. (Original) The reaction vessel of claim 48, further comprising a second interface member at the second electrode compartment between the second electrode and the workpiece site, and wherein the second interface member is configured to prevent selected matter to pass across the second interface member.

50. (Original) The reaction vessel of claim 48. further comprising:

a first annular wall inside the container and a second annular wall inside the container, the second annular wall being between the first annular wall and the outer wall, and wherein a first annular space between the first annular wall and the second

annular wall defines the first electrode compartment and a second annular space outside of the second annular wall defines the second electrode compartment; and

wherein the first electrode is a first annular electrode in the first electrode compartment, and the second electrode is a second annular electrode in the second electrode compartment.

51. (Original) The reaction vessel of claim 48, wherein:

the reaction vessel further comprises a first annular wall inside the container and a second annular wall inside the container, the second annular wall being between the first annular wall and the outer wall, and wherein a first annular space between the first annular wall and the second annular wall defines the first electrode compartment and a second annular space outside of the second annular wall defines the second electrode compartment;

the first electrode is a first annular electrode in the first electrode compartment, and the second electrode is a second annular electrode in the second electrode compartment; and

the vessel also further comprises a second interface member at the second electrode compartment between the second electrode and the workpiece site, and wherein the second interface member is configured to prevent selected matter to pass across the second interface member.

52. (Original) The reaction vessel of claim 51 wherein the first and second interface members comprise filters capable of removing particles from a flow of the processing solution through the first and second electrode compartments.

53. (Original) The reaction vessel of claim 51 wherein the first and second interface members comprise ion-membranes configured to allow selected ions to pass across the membrane.

54. (Original) The reaction vessel of claim 51 wherein the first and second interface members comprise ion-membranes configured to allow selected ions to pass

across the membrane, and wherein the first and second ion-membranes are impermeable to fluids in the processing solution.

55. (Original) The reaction vessel of claim 51 wherein the first and second interface members comprise ion-membranes configured to allow selected ions to pass across the membrane, and wherein the first and second ion-membranes are permeable to fluids in the processing solution.

56. (Original) The reaction vessel of claim 48, further comprising:

a dielectric field shaping unit in the outer container configured to receive the processing solution, the field shaping unit having first and second walls configured to define the first and second electrode compartments, and the first wall having an opening; and

a second interface member at the second electrode compartment between the second electrode and the workpiece site, wherein the second interface member is configured to prevent selected matter to pass across the second interface member, and wherein the first interface member is carried by the first wall over the opening in the first wall and the second interface member is carried by the field shaping unit to contact processing solution contained between the first and second walls.

57. (Original) An apparatus for electrochemically processing a microelectronic workpiece, comprising:

a processing station comprising -

a head assembly having a contact assembly configured to hold a microelectronic workpiece in a processing position and a plurality of contacts configured to contact a portion of the workpiece in the processing position; and

a processing chamber having a housing configured to receive the contact assembly and a reaction vessel in the housing, wherein the reaction vessel comprises -

an outer container having an outer wall;

a first outlet configured to introduce a primary flow into the outer container;

at least one second outlet configured to introduce a secondary flow into the outer container separate from the primary flow;

a dielectric field shaping unit in the outer container coupled to the second outlet to receive the secondary flow, the field shaping unit being configured to contain the secondary flow separate from the primary flow through at least a portion of the outer container, and the field shaping unit having at least one electrode compartment through which the secondary flow can pass while the secondary flow is separate from the primary flow; and

an electrode in the electrode compartment.

58. (Original) The apparatus of claim 57, further comprising a primary flow guide including:

a first baffle having a plurality of first apertures through which at least the primary flow can pass; and

a second baffle downstream from the first baffle, the second baffle having a plurality of second apertures through which the primary flow can pass after passing through the first apertures.

59. (Original) The apparatus of claim 57, further comprising a primary flow guide including:

an annular outer baffle centered on a common axis, the outer baffle having a plurality of first apertures; and

an annular inner baffle positioned concentrically inside the outer baffle, the inner baffle having a plurality of second apertures, wherein the primary flow passes through the first apertures of the outer baffle and then through the second apertures of the inner baffle.

60. (Original) The apparatus of claim 57 wherein the field shaping unit comprises a dielectric wall disposed within the outer wall of the outer container and the electrode compartment is between the dielectric wall and the outer wall, wherein the secondary flow passes through the electrode compartment on one side of the dielectric wall and the primary flow passes on another side of the dielectric wall.

61. (Original) The apparatus of claim 57 wherein the field shaping unit comprises an annular wall in the outer container, the annular wall being spaced radially inward of the outer wall to define a center opening centered on a common axis and the electrode compartment being between the annular wall and the outer wall such that the primary flow passes through the center opening and the secondary flow passes through the electrode compartment.

62. (Original) The apparatus of claim 57 wherein:

the field shaping unit comprises a first annular wall centered on a common axis in the outer container, the first annular wall being spaced radially inward of the outer wall, and a second annular wall in the outer container concentric with first annular wall and between the first annular wall and the outer wall, wherein an inner surface of the second annular wall defines an outer side of a first electrode compartment and an outer surface of the second annular wall defines an inner side of a second electrode compartment; and

the apparatus further comprises a first annular electrode in the first electrode compartment and a second annular electrode in the second electrode compartment.

63. (Original) The apparatus of claim 57, further comprising a distributor coupled to the outer container, the distributor having a central outlet defining the first outlet and a plurality of outer outlets defining second outlets.

64. (Original) The apparatus of claim 63 wherein the distributor comprises:

an inlet for receiving the primary flow and an annular cavity coupled to the inlet, the annular cavity defining the central outlet;

a plenum separate from the inlet for receiving the secondary flow, a plurality of upper orifices in an upper part of the plenum, a plurality of lower orifices in a lower part of the plenum, and a plurality of channels extending from the orifices to a plurality of outer outlets, wherein the outer outlets define the second outlets.

65. (Original) The apparatus of claim 57, further comprising an interface member carried by the field shaping unit downstream from the electrode, the interface member being in fluid communication with the second flow in the electrode compartment, and the interface member being configured to prevent selected matter of the secondary flow from passing to the primary flow.

66. (Original) The apparatus of claim 65 wherein the interface member comprises a filter capable of removing particles from the secondary flow before the secondary flow joins the primary flow.

67. (Original) The apparatus of claim 65 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass from the secondary flow to the primary flow.

68. (Original) The apparatus of claim 65 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass from the secondary flow to the primary flow, and wherein the ion-membrane is at least substantially impermeable to fluid of the second flow.

69. (Original) The apparatus of claim 65 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass from the secondary flow to the primary flow, and wherein the ion-membrane is at least substantially permeable to fluid of the second flow.

70. (Original) The apparatus of claim 57 further defining a processing tool including the reaction vessel, the apparatus further comprising:

a cabinet having an interior enclosure;

a transfer device in the enclosure, the transfer device having an end-effector for handling microelectronic workpieces in the cabinet; and

the processing station being in the interior enclosure.

71. (Original) The apparatus of claim 70 wherein the reaction vessel further comprises a primary flow guide including:

a first baffle having a plurality of first apertures through which at least the primary flow can pass; and

a second baffle downstream from the baffle, the second baffle having a plurality of second apertures through which the primary flow can pass after passing through the first apertures.

72. (Original) The apparatus of claim 70 wherein the field shaping unit of the reaction vessel comprises a dielectric wall disposed within the outer wall of the container and the electrode compartment is between the dielectric wall and the outer wall, wherein the secondary flow passes through the electrode compartment on one side of the dielectric wall and the primary flow passes on another side of the dielectric wall.

73. (Original) The apparatus of claim 70 wherein the reaction vessel further comprises a distributor coupled to the outer container, the distributor having a central outlet defining the first outlet and a plurality of outer outlets defining second outlets.

74. (Original) The apparatus of claim 70 wherein the reaction vessel further comprises an interface member carried by the field shaping unit downstream from the electrode, the interface member being configured to prevent selected matter of the secondary flow from passing to the primary flow and/or to prevent selected matter of the primary flow from passing to the secondary flow.

75. (Original) A processing station for electrochemically processing a microelectronic workpiece, comprising:

a head assembly having a contact assembly configured to hold a microelectronic workpiece in a processing position and a plurality of contacts configured to contact a portion of the workpiece in the processing position; and

a processing chamber having a housing configured to receive the contact assembly and a reaction vessel in the housing, wherein the reaction vessel comprises -

an outer container having an outer wall;

a distributor coupled to the outer container, the distributor having a first outlet configured to introduce a primary flow into the outer container and at least one second outlet configured to introduce a secondary flow into the outer container separate from the primary flow;

a dielectric field shaping unit in the outer container coupled to the distributor to receive the secondary flow, the field shaping unit being configured to contain the secondary flow separate from the primary flow through at least a portion of the outer container, and the field shaping unit having at least one electrode compartment through which the secondary flow can pass while the secondary flow is separate from the primary flow;

an electrode in the electrode compartment; and

an interface member carried by the field shaping unit downstream from the electrode, the interface member being in fluid communication with the secondary flow in the electrode compartment, and the interface member being configured to prevent selected matter of the secondary flow from passing to the primary flow.

76. (Original) The apparatus of claim 75, further comprising a primary flow guide having:

an annular outer baffle centered on a common axis, the outer baffle having a plurality of first apertures; and

an annular inner baffle positioned concentrically inside the outer baffle, the inner baffle having a plurality of second apertures, wherein the primary flow passes through

the first apertures of the outer baffle and then through the second apertures of the inner baffle.

77. (Original) The apparatus of claim 75, further comprising a primary flow guide including:

an annular outer baffle centered on a common axis, the outer baffle having a plurality of generally vertical slots; and

an annular inner baffle positioned concentrically inside the outer baffle, the inner baffle having an inverted frusto-conical shaped wall with a plurality of annularly extending radial slots that slant upward relative to the common axis, wherein the primary flow passes through the vertical slots of the outer baffle and then through the annular slots of the inner baffle to project radially inward and upward relative to the common axis along a plurality of diametrically opposed vectors.

78. (Original) The apparatus of claim 75 wherein the field shaping unit comprises a dielectric wall disposed within the outer wall of the outer container and the electrode compartment is between the dielectric wall and the outer wall, wherein the secondary flow passes through the electrode compartment on one side of the dielectric wall and the primary flow passes on another side of the dielectric wall.

79. (Original) The apparatus of claim 75 wherein:

the field shaping unit comprises a first annular wall centered on a common axis in the outer container, the first annular wall being spaced radially inward of the outer wall, and a second annular wall in the outer container concentric with first annular wall and between the first annular wall and the outer wall, wherein an inner surface of the second annular wall defines an outer side of a first electrode compartment and an outer surface of the second annular wall defines an inner side of a second electrode compartment; and

the apparatus further comprises a first annular electrode in the first electrode compartment and a second annular electrode in the second electrode compartment.

80. (Original) The apparatus of claim 75 wherein the distributor comprises:

an inlet for receiving the primary flow and an annular cavity coupled to the inlet, the annular cavity defining the first outlet;

a plenum separate from the inlet for receiving the secondary flow, a plurality of upper orifices in an upper part of the plenum, a plurality of lower orifices in a lower part of the plenum, and a plurality of channels extending from the orifices to a plurality of outer outlets, wherein the outer outlets define second outlets.

81. (Original) The apparatus of claim 75 wherein the interface member comprises a filter capable of removing particles from of the secondary flow before the secondary flow joins the primary flow.

82. (Original) The apparatus of claim 75 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass from the secondary flow to the primary flow.

83. (Original) The apparatus of claim 75 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass from the secondary flow to the primary flow, and wherein the ion-membrane is at least substantially impermeable to fluid of the second flow.

84. (Original) The apparatus of claim 75 wherein the interface member comprises an ion-membrane configured to allow selected ions to pass from the secondary flow to the primary flow, and wherein the ion-membrane is at least substantially permeable to fluid of the second flow.

85. (Original) A processing station for electrochemically processing a microelectronic workpiece, comprising:

a head assembly having a contact assembly configured to hold a microelectronic workpiece in a processing position and a plurality of contacts configured to contact a portion of the workpiece in the processing position; and

a processing chamber having a housing configured to receive the contact assembly and a reaction vessel in the housing, wherein the reaction vessel comprises -

an outer container having an outer wall;

a distributor coupled to the outer container, the distributor having a first outlet configured to introduce a primary flow into the outer container and at least one second outlet configured to introduce a secondary flow into the outer container separate from the primary flow;

a primary flow guide in the outer container coupled to the distributor to receive the primary flow and direct it to a workpiece processing site;

a dielectric field shaping unit in the outer container coupled to the distributor to receive the secondary flow, the field shaping unit being configured to contain the secondary flow separate from the primary flow through at least a portion of the outer container, and the field shaping unit having at least one electrode compartment through which the secondary flow can pass while the secondary flow is separate from the primary flow;

an electrode in the electrode compartment; and

an interface member carried by the field shaping unit downstream from the electrode, the interface member being in fluid communication with the secondary flow in the electrode compartment, and the interface member being configured to prevent selected matter of the secondary flow from passing to the primary flow.

86. (Original) A processing station for electrochemically processing a microelectronic workpiece, comprising:

a head assembly having a contact assembly configured to hold a microelectronic workpiece in a processing position and a plurality of contacts configured to contact a portion of the workpiece in the processing position; and

a processing chamber having a housing configured to receive the contact assembly and a reaction vessel in the housing, wherein the reaction vessel comprises -

an outer container having an outer wall;

a first fluid conduit carried by the outer container, the first fluid conduit having a first inlet and a primary flow channel coupled to the first inlet, the primary flow channel being in the outer container and configured to direct a primary fluid flow toward a workpiece processing site;

a second fluid conduit carried by the outer container, the second fluid conduit having a dielectric field shaping unit including at least one electrode compartment, the second fluid conduit containing a secondary fluid flow separate from the primary fluid flow through at least a portion of the outer container;

at least one interface member carried by the field shaping unit configured to prevent selected matter of the secondary fluid flow from passing to the primary fluid flow; and

at least one electrode in the at least one electrode compartment upstream from the interface member.

87-90. (Cancelled)